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(56) Documents Cited  
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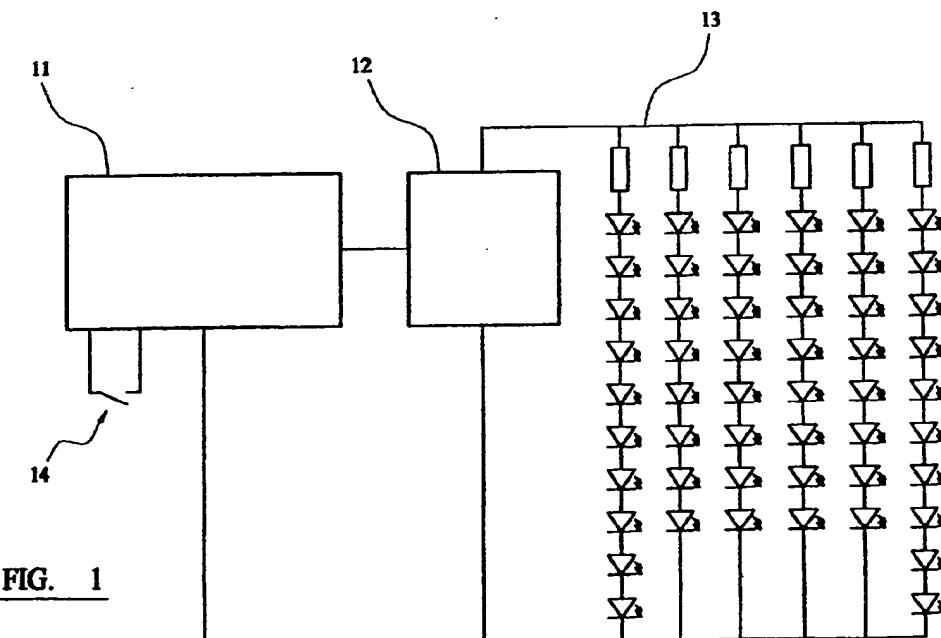
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(54) Abstract Title

Acne treating apparatus based on the emission of light in three different ranges of wavelength

(57) An acne treating apparatus comprising light emitting means (13) which, in use, emit light onto an area of skin to be treated wherein the light emitting means is adapted to emit light at three different wavelengths, the first wavelength of light selected from the range of 365 to 465 nm, the second wavelength of light selected from the range of 585 to 645 nm and the third wavelength of light selected from the range 646 to 710 nm.

The light emitting means are preferably super luminous light emitting diodes (SLEDs) with an output of up to 50mW per cm<sup>2</sup>. They may emit continuous or pulsed light. The operation of the apparatus is preferably controlled by a microprocessor (11).



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The print reflects an assignment of the application under the provisions of Section 30 of the Patents Act 1977.

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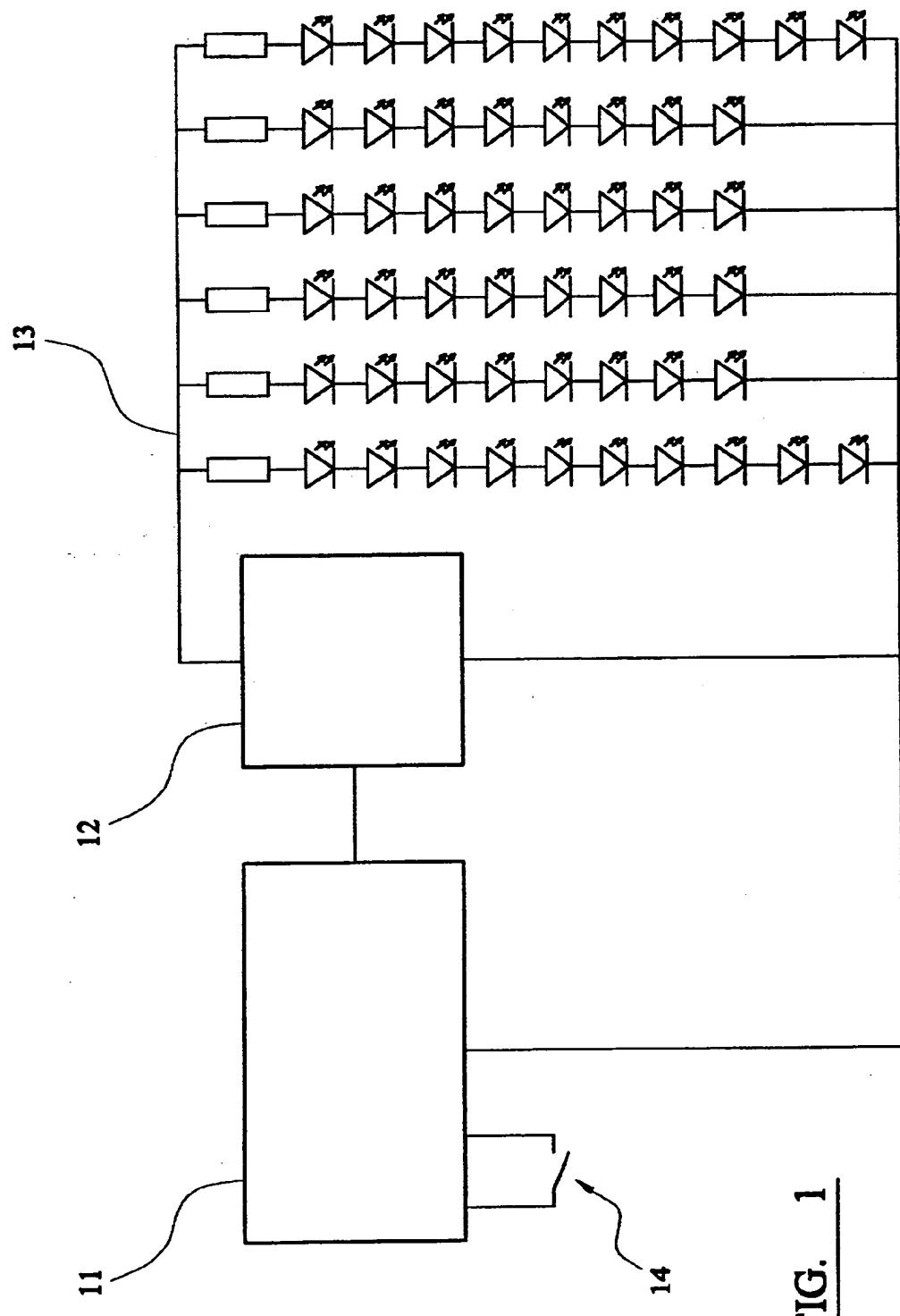


FIG. 1

10 16 01

-2/2-

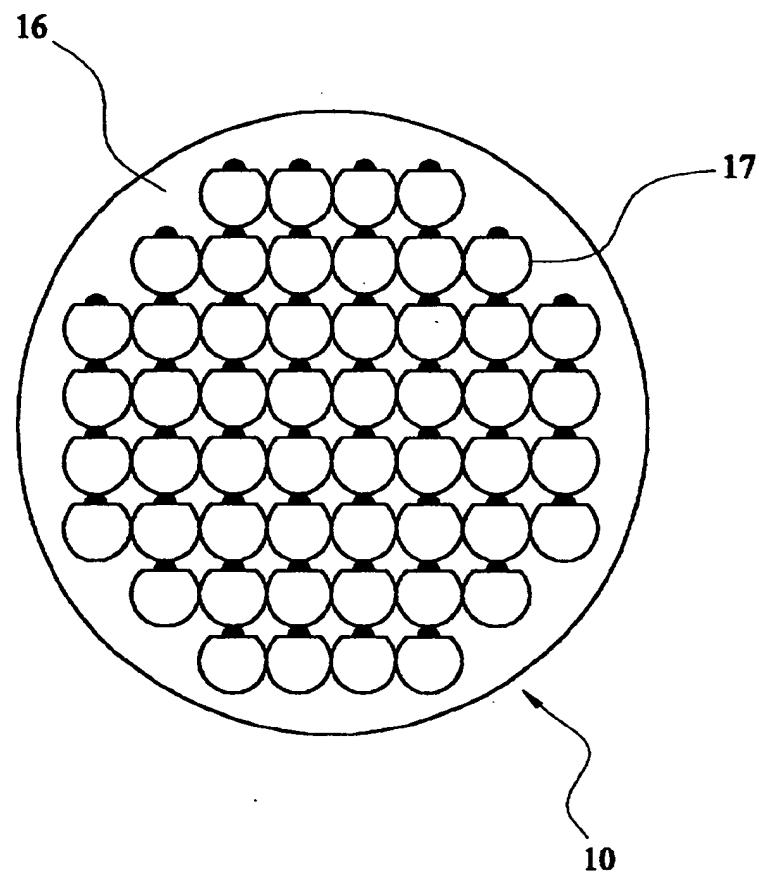


FIG. 2

## AN APPARATUS FOR THE TREATMENT OF A SKIN COMPLAINT

The present invention relates to an apparatus for the treatment of a skin complaint. More particularly, the present invention relates to an apparatus for the treatment of acne.

*Propionibacterium acnes* (*P.acnes*) are normal inhabitants of the human skin in particular, the pilosebaceous ducts. Increased amounts of *P.acnes* have been observed to be present in acne sufferers.

Research has established that *P.acnes* is microaerophilic, that is, it can only tolerate small amounts of oxygen, and that *P.acnes* use porphyrins in their respiratory system.

When subjected to certain wavelengths of light, it has been observed that porphyrins become excited and produce oxygen. In this connection, we have established that by triggering the excitation of porphyrins in this manner, it is possible to kill *P.acnes* and hence, treat acne.

According to the present invention there is provided an acne treating apparatus comprising light emitting means which, in use, emit light onto an area of skin to be treated wherein the light emitting means is adapted to emit light at three different wavelengths, the first wavelength of light selected from the range of 365 to 465 nm, the second wavelength of light selected from the range of 585 to 645 nm and the third wavelength of light selected from the range 646 to 710 nm.

In a preferred embodiment, the first wavelength of light emitted by the light emitting means is 415 or 440 nm, the second wavelength of light is 635nm and the third wavelength of light is 660nm. Research has shown that an apparatus emitting light at the aforementioned wavelengths provides good results.

In a preferred embodiment, the light emitting means are super luminous light emitting diodes (SLEDs). The advantage of using SLEDs is that they are capable of providing the required power intensity of light necessary to kill *P.acnes* in sufficient numbers to effect the pathogenesis of acne. Further preferably, the SLEDs are arranged in a cluster on a face of the apparatus in accordance with the present invention. Preferably, the cluster includes 16 SLEDs emitting light having a wavelength selected from the range of 365 nm to 465 nm, preferably 415 or 440 nm, 18 SLEDs emitting light having a wavelength selected from the range of 585 to 645 nm, preferably 635 nm, and 18 SLEDs emitting light having a wavelength selected from the range of 646 to 710 nm, preferably 660 nm. However, it is to be understood that the light emitted by an apparatus in accordance with the present invention can originate from any light emitting source, for example, via fibre optics.

Further preferably, the light emitting means can irradiate up to 50cm<sup>2</sup>, preferably 24cm<sup>2</sup>, of skin at any one time.

Further preferably, the light emitting means has an output of up to 50 mW per cm<sup>2</sup>, preferably 6mW per cm<sup>2</sup>.

Further preferably, the light emitting means can emit pulsed light. In this connection, research has established that all cells have energy intensity, wavelength and frequency windows. That is, specific values of these parameters can be used to increase cell permeability, as well as activate various forms of cellular activity, for example, synthesis, secretion and

intracellular communication. During our research, we have observed that the various forms of cellular activity mentioned above are increased when such cells are irradiated by specific frequencies of pulsed or modulated light. Additionally, we have observed that pulsed light can trigger the release of particular wound mediators, which accelerate tissue repair.

Further preferably, the light emitting means can emit continuous and pulsed light sequentially. The advantage of having an apparatus which can firstly apply continuous light and then pulsed light, is that exposure of the skin to continuous light will firstly kill the *P.acnes* and subsequent exposure of the skin to pulsed light, will additinally facilitate healing of the skin tissue.

Further preferably, the pulsed or modulated light emitted from the light emitting means has a frequency of 18Hz. We have observed that this frequency gives best results.

Further preferably, the apparatus in accordance with the present invention comprises control means for controlling the duration of light being emitted from the light emitting means and/or for switching between the emission of continuous light and pulsed light. This has the advantage in that the apparatus controls the duration of light and type of light being emitted and therefore, is less susceptible to human error. Further preferably, the control means causes the light emitting means to emit continuous light for a period of up to 40 minutes and/or pulsed light for a period of up to 40 minutes. Preferably, the control means causes the acne apparatus in accordance with the present invention to emit continuous light and then pulsed light sequentially. Further preferably, the control means causes the light emitting means to emit continuous light for a period of 5 minutes and then pulsed light for a period of 5 minutes.

Further preferably, the apparatus in accordance with the present invention is hand-held. This has the advantage in that the apparatus can be used to precisely direct the emitted light onto areas of the skin that are particularly infected with acne.

One embodiment of the present invention will now be described by way of example and with reference to the accompanying drawings in which:

Fig. 1 is a schematic diagram of acne treating apparatus in accordance with the present invention; and

Fig. 2 is a front view of the light emitting face of an apparatus in accordance with the present invention.

As illustrated in Fig. 1, an acne treating apparatus 10 in accordance with the present invention includes a microprocessor 11 that controls the duration and type of light being emitted by the apparatus 10 coupled to a power switching 12 and chains of super luminous light emitting diodes 13. Preferably, each chain of SLEDs include three different wavelengths and are ballasted to control the current therethrough. Additionally, the microprocessor has a start button 14 which when pressed, results in the activation of the acne treating apparatus 10.

As illustrated in Fig. 2, the apparatus 10, comprises a number of super luminous light emitting diodes 17 on the face 16 thereof. In the illustrated embodiment, 16 of the SLEDs located on the base 16 emit light having a wavelength of 415nm, 18 SLEDs emit light having a wavelength of 635 nm and 18 SLEDs emit light having a wavelength of 660 nm.

In a further aspect of the present invention there is provided a method of treating acne by exposing an area of skin to be treated to three wavelengths of light, the first wavelength of light selected from the range of 365 to 465 nm, the second wavelength of light selected from the range of 585

to 645 nm and the third wavelength of light selected from the range of 646 to 710 nm.

Preferably, the first wavelength of light has a wavelength of 415 or 440 nm, the second wavelength of light has a wavelength of 635 nm and the third wavelength of light has a wavelength of 660 nm.

Further preferably, the light is pulsed light. Preferably pulsed at a frequency of 18Hz.

Further preferably, the area of skin to be treated is treated with continuous light for up to 40 minutes and/or pulsed light for a period of up to 40 minutes.

Preferably, the area of skin to be treated is treated with continuous light and then pulsed light. Preferably, the area of skin to be treated is treated with continuous light for 5 minutes and then pulsed light for 5 minutes.

**CLAIMS**

1. An acne treating apparatus comprising light emitting means which, in use, emit light onto an area of skin to be treated wherein the light emitting means is adapted to emit light at three different wavelengths, the first wavelength of light selected from the range of 365 to 465 nm, the second wavelength of light selected from the range of 585 to 645 nm and the third wavelength of light selected from the range 646 to 710 nm.
2. An apparatus as claimed in claim 1, wherein the first wavelength of light emitted by the light emitting means is 415 nm, the second wavelength of light emitted by the light emitting means is 635 nm and the third wavelength of light emitted by the light emitting means is 660 nm.
3. An apparatus as claimed in claim 1 or 2, wherein the light emitting means are super luminous light emitting diode.
4. An apparatus as claimed in claim 3, wherein the super luminous light emitting diodes are arranged in a cluster on a face of the apparatus.
5. An apparatus as claimed in claim 4, wherein the cluster includes 16 super luminous light emitting diodes emitting light having a wavelength selected from the range 365 to 465 nm, 18 super luminous light emitting diodes emitting light having a wavelength selected from the range of 585 to 645 nm and 18 super luminous light emitting diodes emitting light having a wavelength selected from the range of 646 to 710 nm.

6. An apparatus as claimed in claim 5, wherein the cluster includes 16 super luminous light emitting diodes emitting light having a wavelength of 415 nm, 18 super luminous light emitting diodes emitting light having a wavelength of 635 nm and 18 super luminous light emitting diodes emitting light having a wavelength of 660 nm.
7. An apparatus as claimed in any one of the preceding claims, wherein the light emitting means can irradiate up to 50 cm<sup>2</sup> of skin with light.
8. An apparatus as claimed in claim 7, wherein the light emitting means irradiate 24 cm<sup>2</sup> of skin with light
9. An apparatus as claimed in any one of the preceding claims, wherein the light emitting means has an output of up to 50 mW per cm<sup>2</sup>.
10. An apparatus as claimed in claim 9, wherein the light emitting means has an output of 6 mW per cm<sup>2</sup>.
11. An apparatus as claimed in any one of the preceding claims, wherein the light emitting means emits continuous light and/or pulsed light.
12. An apparatus as claimed in claim 11, wherein the light emitting means emits continuous light and then pulsed light sequentially.
13. An apparatus as claimed in any one of claims 11 or 12, wherein the pulsed light is emitted at a frequency of 18Hz.
14. An apparatus as claimed in any one of claims 11 to 13, further comprising control means for controlling the duration of light being emitted from the light emitting means and/or for switching between the emission of continuous light and pulsed light.

15. An apparatus as claimed in claim 14, wherein the control means causes the light emitting means to emit continuous light for a period of up to 40 minutes and/or pulsed light for a period of up to 40 minutes.
16. An apparatus as claimed in claim 15, wherein the control means causes the light emitting means to emit continuous light for a period of five minutes and then pulsed light for a period of five minutes.
17. A hand-held acne treating apparatus as claimed in any one of the preceding claims.
18. An acne treating apparatus substantially as hereinbefore described with reference to the accompanying drawings.



Application No: GB 9923029.4  
Claims searched: 1-18

Examiner: Anwar Gilani  
Date of search: 31 January 2000

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): A5R (REHR)

Int Cl (Ed.7): A61N 5/06, 5/08

Other: Online:WPI, EPODOC, JAPIO

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
Y	EP0884066 A2 (SLI LICHTSYSTEME) see WPI abstract	1 at least
A	WO96/14899 A1 (OPTOMED) see WPI abstract and p.12 l.19-25	
Y	US5549660 (MENDES ET AL) col.1 l.47-57, col.3 l.37-45	1 at least
A	DE4440112 A (WILKENS) see WPI abstract	
X	DE4026327 A (GOLF) see WPI abstract	1 at least
X	FR2752739 A (HOME) see WPI abstract	1 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.